# SCIENCE

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CONTENTS



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## THE RESEARCH SPIRIT IN EVERYDAY LIFE OF THE AVERAGE MAN[1]

RESEARCH has been considered generally as a phase of effort quite distinctly set off from the natural course of human interest. It is my purpose to discuss the spirit or attitude of investigation as normally involved in the everyday working plans of the average person.

Of the significance of research in all fields of our endeavor the extraordinary advances and applications of science in the recent war have not left the world in doubt. For nearly half a century Germany had been known as a nation given to investigation in a great variety of little explored subjects, and governed in considerable measure in accordance with the results of such researches. The strength of German military organization, backed by scientific and economic interests welded into one powerful instrument, brought to all the Allied Powers full realization of the need for a supreme effort of intellect in many kinds of scientific and economic operation previously unknown. The result of this reaction was a stupendous contribution to application of research. Incidental failures, due to unpreparedness and to lack of organization, may not detract from the importance of what was thus produced.

No less clear is now in post-war reconstruction the evidence of need for entirely new views of old knowledge, for immediate answer to old questions not yet solved, and for quick results of investigation on problems of construction never before encountered. As had been predicted, we find ourselves to-day going forward to new plans of human organization, but more unsatisfactorily prepared for the complex situations of the new era than we

[1] Delivered as the address of the retiring president of the Pacific Division, American Association for the Advancement of Science at Seattle, Washington, June 17, 1920.

were for the more narrowly limited and clearly defined issues precipitated by sudden climax of war. Conflict such as that through which we have just passed intensified interest and brooked no delay in judgment. Reconstruction under peace conditions sets no precise time limits for its decisions. Therefore, we face to-day the settlement of great questions upon which the future of the world depends, but without that definite intention of judgment called forth by the immediate urgency of war-time crises. Our need for solving present vital problems requires a clear understanding of what the questions are and a determination of the responsibility for their solution. While we may assume that this responsibility rests more heavily upon some than it does on others, it is my purpose to call attention to the part which all thinking people have in the movement to bring these great issues to settlement.

In order that there be no misconception of the views presented, it should be clear that the interpretation of research in this discussion comprises not merely the detailed investigations of fundamental scientific principles, but with this includes all inquiry which may be included within the range of thought leading to constructive action. The mere acquisition of knowledge does not contribute unless it is carried on in such a relation that it leads ultimately to the process of building. On the other hand, construction can not go on without the process of investigation, as each new building operation involves an individual problem to be solved.

Some one has said that much of research—with the accent on the "re"—may be so called because after completion it becomes necessary with much labor to search it out again when real opportunity for use appears. Work of an investigational nature carried on with the right spirit, and with proper organization, should be planned to find its place without great loss of energy or time, or at least be located where, with other building materials, it lies at hand ready for use as required.

The research spirit represents a reaching out to understand and use all that lies about us. Its expression is as natural to a thinking mind as hunger is to stomachs. Its origin is by some compared to an awakening—in which we recognize the world of things about us but have come as yet only partially to know it. I prefer to think of it as identified with the growth tendency inherent in biological organisms, which may carry us on and on without limit, as our powers and range increase from age to age. Constructive work is inseparably a part of the living of intellectual life.

Much of misunderstanding that arises generally regarding the function and place of research relates itself to false conceptions, *first* of the limits of the broad field of knowledge, and *second* of the degree of stability in nature and in man as an outgrowth of the natural world.

An astonishingly large percentage of the human family conceives of available knowledge as comprising nearly all that may be known, and including much not worth knowing. Such views are not limited to uneducated persons, but have been found among scientific men accepting as final all present fundamental theories of the nature of matter, origin of the earth, relationship of life forms, and other equally critical interpretations of the natural universe. It has required the shock of many recent discoveries in physics, chemistry, astronomy and biology to make clear the fact that our understanding of much that is nearest to us is only imperfectly formulated; and that in the present period we can be assured of a field of the unknown, but not unknowable, about us so vast that realization to our ignorance makes us look only with humble pride upon past accomplishment. To such a field for endeavor as I have remarked for science there may be compared similar regions in the economic, governmental, and cultural subjects, toward which not only the student but the man of business and of affairs looks out with strong desire for attainment of much in knowledge that has not yet been reached. In our day the research of business on scientific lines bulks large in comparison with non-applied science, and present accom-

plishment has only stimulated the desire for further advance. Every evidence that we have indicates the wide open range for discovery of new principles and new applications of knowledge in practically every field which the intellect explores.

In an attempt to understand the need for continuous research activity, an acquaintance with the order of stability or instability in nature and in human affairs is hardly less important than a conception of the relatively narrow limits of attained knowledge. Human beings seem curiously inconsistent in that though they are stunted individually without constant growth or change, they attempt to deceive themselves into belief that an unchanging situation is the normal condition of nature. We calculate an average rainfall and expect it to rain just so many inches, be it 24 or 46 each year. We are shocked if it rains less. We see the rocks distorted and torn by countless movements dating through all past periods of earth's history, but we are surprised when a slip of a few inches disturbs the seeming present-day stability and produces an earthquake. We build highways of concrete and are astonished that they wear out. We write constitutions and expect the judgment of the men who made them to fit all times and conditions. Yet history shows us that with the law which states that nothing is completely destroyed, we must write with Pythagoras that nothing remains continuously the same. The geological book—the greatest historical document of all the ages—gives us as one of its truths the fact that in the known hundred or more million year record of life, nothing has remained in constant form; that the rule has been not only continuous change but also continuous advance of the highest level. Through vast periods man has himself been subject to changes like those that have been expressed in other living types; and the habit of nature so set forth seems to indicate that with the earth in continuous state of modification we may expect life and man to keep for the future a rate of growth not less rapid than that of past ages. Assured of the validity of these principles, we can be certain that as a race and as individuals we shall be almost continuously under the necessity of meeting adjustment and readjustment to new conditions. We have to face not merely the question of new knowledge which research should secure for the use of the moment, but with this we must have understanding which will guide and support us in the continuous movement incidental and evolutional which must be looked upon as the natural order.

With realization of the unattained limits of knowledge, and with the conception of continuously operating growth and readjustment to which we as individuals and as groups are subject, there comes to every person an understanding of the necessity for continuously operating constructive work. The giving of such a view as has been suggested is in my interpretation a necessary part of the broad function of education.

Education should not only give the wider and deeper view of the structure of knowledge, but with this it should furnish an acquaintance with the methods by which knowledge is obtained and applied. By one classification, educational work may be given five great purposes: (1) To determine our individual capacity for knowledge, and adaptability to special subjects; (2) acquisition of facts; (3) learning quality of judgment and organization of materials; (4) developing power to construct or create; (5) forming of character and development of altruistic motives. Education often concentrates itself on the acquisition of knowledge or of facts organized and unorganized, neglecting in considerable measure questions of capacity, training of judgment, constructive ability, and the development of character. Not without significance is an illustration in a recent publication representing a student with his arms piled full of books marked "knowledge," but unable to accept the volume of "wisdom" or judgment offered to him.

The third and fourth of the five points mentioned in the classification of educational aims, namely, judgment and creative ability, are in a large measure representative of re-

search. Though based upon the accumulation of facts, the critical significance of research lies in the quality of judgment and organization leading to constructive use, with the ultimate goal of application or service. One of the greatest contributions that education of the future can make is to place the emphasis in training on a broader view of organization of knowledge, on the ability to judge and construct, and on the desire for service. Not until such an understanding of the function of educational training comes into general acceptance, can we expect the average man to be brought into full participation or interest in the spirit and opportunity of the constructive work of the world required from day to day.

It is, I believe, also a responsibility of the educator to bring about a better understanding of the relation between the two great ideals of *construction* and of *service* which are fundamental to the philosophy of right living. Two groups of persons who contribute greatly to advance the comfort and happiness of mankind are, those who produce the new ideas upon which we build from age to age, and those who give themselves to public service in the larger sense. There is in my judgment a close and necessary connection between these two types of relations to the community. Research should lead to construction and is not complete unless the results are available for general use; while public service rarely attains the purpose for which it is initiated unless it is distinctly constructive.

I have spoken up to this time of the broader view of research, and of its more general relation to great problems with which we are confronted. In considering specifically the connection of this phase of thought with the life of the average man, we should look more particularly to the practical value of constructive work in contacts which may be considered representative of everyday life.

Research or constructive work is often divided into two types, one concerning fundamental principles without regard to their immediate application; the other, sometimes designated as research of application, representing especially the investigation of methods by which principles already known are put to human use.

The first type of investigation has been advanced especially in institutions concerned particularly with scientific and educational problems. Much fundamental investigation has, however, been conducted by engineering and governmental laboratories established specifically for the purpose of contributing to clearly determined needs. Through acquaintance with any one of many occupations such as agriculture, engineering, or business, the average person is sooner or later intimately in contact with some phase of this type of research.

Research of application reaches its highest expression in the great engineering laboratories of corporations recognizing the possibility of drawing from the field of investigation uses of scientific laws or principles, which may make possible great saving or higher efficiency in the conduct of their business. Enterprises organized for legitimate gain do not always make increased income by increased profit percentage, but often by increase in volume of business, introduction of new materials, or utilization of new ideas. Volume of business may mean increase of plant. The use of new materials often means a practical reorganization of plant and increased expenditure. Introduction of new ideas may mean increased efficiency, increased profit, and, with the exception of purchase of patents, may not require continued increase of expenditure.

Research of application finds general use in the problems of everyday business and everyday life, in which we are forced to make decisions which lie between following rule of thumb methods and the possibility of making a special judgment for every situation which confronts us. It is the difference between the attitude of the oculist or optician who has just so many possible standard types of cases into which all eye troubles can and must fit, and the other man who, under normal circumstances, considers each eye as different from every other and judges it specifically, accord-

ing to the fundamental laws of physics basic to his subject. It is the difference between the type of housewife who makes all pies in California according to the rules used by her grandmother in Maine, regardless of the character of the flour, or the kind of fruit; and the other housewife who, according to the materials involved and the end to be attained, judges through experience and experiment the combinations most acceptable.

The average man of intelligence comes to recognize in the course of his thinking that he lives in a world which we understand only imperfectly. At every turn he encounters the limits of his own knowledge and of our total accumulated store. In every kind of business or occupation he moves among those concerned with attack upon problems which are new in the general as well as in the individual sense. In some small part he is called upon to help in the solving of these questions. He is also expected to know how to secure information on problems which he needs to solve. In a still larger way he must understand the movement toward solution of economic and governmental question, in order that as a citizen he may exercise his privilege of giving intelligent support to those whose special work it is to investigate these matters and to pass judgment upon them.

It is a part of the duty of the average man to know the difference between pernicious questioning and constructive thinking; to judge what things of the established order should be left alone and which should now be changed. He must be a conservative, standing for stability, and yet recognize the constitutional evanescence of all things natural and human, and stand for progressive movements at critical times.

The average man must learn to know and value the contribution of the specialist or expert in constructive work, and call into his service men representing fields other than his own particular province. The habit of requesting properly organized investigation must be developed and put into operation in directions which show promise of leading to results of importance to the community interests.

The average man will do his research mainly in the field of application, rather than in studies of fundamental principles, but he will find the pleasures of constructive work outweighing in realization all other types of enjoyment. He will discover here a continuing interest which leads on with undiminished attraction and brings renewal of life stimulus.

As opposed to the life of constructive type, we may visualize the conservatism of habit in those individuals who fit themselves into the treadmill cycle of custom. Their individuality wears down to nothing, and they become only cogs in a machine of which neither the structure nor the purpose is seen. On the other hand, the constructive life means not alone continuous growth and unending youth, but it offers as well the largest opportunity for enjoyment of service. It furnishes the basis for that reaffirmation of individuality which both in science and in human service has been characterized as being born again. One who constructs and accomplishes sees new life. Those who follow blindly and without individual vision are sometimes known as of the practical type, and not infrequently pride themselves on refusing to accept the new which may be good and perpetuating in their life work the errors of their grandfathers, which the grandfathers would not thus have carried on.

Research and advancement of knowledge in the future depend not alone upon expressions of individual genius, nor upon opportunity for concentrated investigation in limited fields. The intelligent use of results of constructive work by the people as a whole, a general understanding of the methods by which this information has been obtained, and a knowledge of the means necessary to support research are also indispensable. Great advances of the future are not dependent upon having every man do everything as an expert, but they will rest upon a wide appreciation of the importance of constructive thought, of organized knowledge, and of the need for continuous advance of knowledge.

Education will play a large part in the support of research through giving, even in

elementary courses, the proper view of knowledge and an understanding of the means by which it grows. Nothing would probably go farther toward bringing us to a satisfactory view of our present situation than a course of instruction on that which we do not know, but which might by investigation become known. With this there should go a presentation of evidence as to the methods by which constructive work could bring this information and apply it.

A great responsibility for realization of the possibilities in education rests upon those scientific organizations which have given themselves especially to the problems of constructive thought. Through the scientific institutions which we represent, it is our duty to make clear the function of education to train in judgment and construction rather than to encourage merely the amassing of facts. A responsibility rests upon us to see also that the results of our own investigations are not buried more deeply than were the materials upon which they have been based. New ideas should be clearly recognized, fully stated, and placed where the applying engineer may find the data which he requires to meet human needs. We have again a duty, so to organize our work that other investigators and applyers may not only know the results, but that they may cooperate with us to mutual benefit.

There is no doubt that properly organized and coordinated efforts of science and education may increase greatly the present opportunity of the average man for constructive activity, making his life more useful and happier. The average man of the future will of necessity live his life largely in a routine based upon customs of the prevailing social order. He will give himself to action governed by established rules formulated from experience; but always and increasingly in his individual affairs, as in his relation to the community, he will find his largest measure of satisfaction in the building type of effort originating through his own thinking. As the product of the life work of each individual accumulates, the evidence of true individuality will become more clear, until there emerges from the chrysalis stage of mere physical and mental separateness the newborn personality of one who in creating an idea has given to himself the right of eternal individual recognition as an intentional participant in human progress.

As the problems of community organization become more clearly visualized, the importance of the research or constructive spirit in the average man will increase, and the future of democracy depends in a measure upon the possibility of securing for each capable person an opportunity to obtain the wider view of the greater problems, to learn dependence upon those who know and are true, and with all this to make contribution in an unselfish spirit. Unless these objects are realized we are doomed to revolve without progress through endless cycles of misunderstanding and conflict.

Education with its varying emphasis on the fundamental truths of science, philosophy, human relations and religion is our principal safeguard. Our definite guarantees of progress are found in the lessons of history, taken with the present wide expression of individual responsibility for judgment in the critical affairs of citizenship.

John C. Merriam

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## DOCTORATES CONFERRED IN THE SCIENCES BY AMERICAN UNIVERSITIES IN 1920

A compilation of the doctorates conferred by American universities has been made for each year from 1898 to 1916, and the data published in Science annually through 1915 and in *School and Society* for 1916. Dr. Burg, who compiled the last annual statistics, severed his university connection in 1917 and the compilation was turned over to someone else who for various reasons was unable to complete the work. No statistics, therefore, are available for 1917–18 and 1918–19, but the compilation has been resumed for the academic year 1919–20 in so far as the doctorates conferred in the sciences are con-

cerned, and the comparison with previous years indicates that conditions affecting doctorates have regained a normal state. There has been no increase in the number conferred, nor any considerable decrease.

In 1920 there were 328 doctorates conferred in the natural and physical sciences by 31 institutions. In 1916 there were 332 conferred by 28 institutions. It is interesting to note that the small decrease in the number of degrees conferred is practically equalled by the small increase in institutions conferring them. Those institutions which have always been at the head of the list have changed their order in some cases, but are still leading. However, the degrees seem to be more widely distributed than formerly. The University of Chicago continues to confer the largest number of degrees, while Cornell University takes second place. As usual, the eastern universities lead in numbers conferred, though the western and middle western institutions follow very closely with only 14 less. Johns Hopkins University dropped from 23 in 1915 and 22 in 1916 to 17 in 1920, and Harvard rose from 16 in 1916 to 28 in 1920. Wisconsin and Illinois have taken their places in the first group, with 24 and 22 degrees respectively. There were 14 universities conferring degrees in the past which conferred none this year.

Chemistry continues to head the list of subjects in which the doctorates were conferred, though with not so large a number as in 1916, nor so great a per cent. of the total. In 1916 there were 115 conferred in chemistry and in 1920 there were 96. Small gains in many of the other sciences bring up the total. The most noticeable gain is in psychology, which has risen from 22 in 1915, and 19 in 1916 to 40 in 1920. No doctorates were conferred specifically in paleontology, mineralogy, metallurgy or meteorology.

A list of the names of the recipients of the doctorates with the titles (sometimes abridged) of their theses has been made, classified by the subject in which the degree was conferred, and grouped under the subject according to the university conferring them.

DOCTORATES CONFERRED IN THE SCIENCES IN AMERICAN UNIVERSITIES

| | '12 | '13 | '14 | '15 | '16 | '20 |
|---|---|---|---|---|---|---|
| Chicago | 37 | 16 | 28 | 53 | 53 | 59 |
| Cornell | 28 | 30 | 36 | 26 | 24 | 35 |
| Harvard | 15 | 22 | 28 | 33 | 16 | 28 |
| Columbia | 36 | 27 | 21 | 27 | 34 | 24 |
| Wisconsin | 14 | 5 | 17 | 8 | 22 | 24 |
| Yale | 21 | 19 | 13 | 20 | 24 | 23 |
| Illinois | 15 | 11 | 18 | 17 | 26 | 22 |
| Johns Hopkins | 23 | 21 | 18 | 23 | 22 | 17 |
| California | 12 | 9 | 11 | 16 | 17 | 14 |
| George Washington | 2 | 1 | 2 | 4 | 5 | 9 |
| Michigan | 8 | 10 | 5 | 15 | 10 | 9 |
| Princeton | 7 | 7 | 7 | 4 | 19 | 9 |
| Ohio | 5 | 0 | 0 | 1 | 2 | 6 |
| Indiana | 4 | 1 | 2 | 4 | 3 | 5 |
| Iowa | 3 | 2 | 2 | 2 | 2 | 5 |
| Mass. Tech. | 6 | 1 | 2 | 2 | 3 | 5 |
| Pennsylvania | 9 | 9 | 5 | 11 | 16 | 5 |
| Clark | 6 | 13 | 7 | 10 | 9 | 4 |
| Minnesota | 2 | 2 | 3 | 4 | 7 | 4 |
| Stanford | 3 | 5 | 2 | 2 | 0 | 4 |
| Brown | 4 | 1 | 4 | 5 | 2 | 2 |
| Cincinnati | 1 | 2 | 2 | 0 | 2 | 2 |
| Missouri | 0 | 1 | 1 | 1 | 3 | 2 |
| Pittsburgh | 1 | 5 | 0 | 4 | 0 | 2 |
| New York | 2 | 3 | 1 | 3 | 0 | 2 |
| Syracuse | 0 | 0 | 0 | 0 | 0 | 2 |
| Bryn Mawr | 3 | 0 | 2 | 0 | 3 | 1 |
| Catholic | 1 | 0 | 0 | 2 | 1 | 1 |
| Kansas | 0 | 0 | 0 | 0 | 0 | 1 |
| Radcliffe | 0 | 0 | 0 | 0 | 0 | 1 |
| Virginia | 2 | 2 | 1 | 0 | 2 | 1 |
| Total | 273 | 234 | 241 | 309 | 332 | 328 |

DOCTORATES DISTRIBUTED ACCORDING TO SUBJECTS

| | '12 | '13 | '14 | '15 | '16 | '20 |
|---|---|---|---|---|---|---|
| Chemistry | 78 | 68 | 71 | 85 | 115 | 96 |
| Botany | 30 | 28 | 34 | 40 | 36 | 47 |
| Psychology | 29 | 24 | 12 | 22 | 19 | 40 |
| Zoology | 20 | 26 | 25 | 32 | 33 | 38 |
| Mathematics | 22 | 21 | 25 | 23 | 34 | 20 |
| Physics | 30 | 22 | 23 | 31 | 35 | 20 |
| Geology | 23 | 14 | 13 | 26 | 17 | 16 |
| Physiology | 12 | 2 | 8 | 8 | 14 | 14 |
| Agriculture | 11 | 8 | 9 | 9 | 6 | 8 |
| Bacteriology | 6 | 3 | 6 | 4 | 4 | 7 |
| Astronomy | 2 | 11 | 2 | 7 | 6 | 6 |
| Engineering | 2 | 0 | 4 | 2 | 2 | 5 |
| Anatomy | 6 | 1 | 2 | 5 | 1 | 3 |
| Geography | 0 | 1 | 0 | 3 | 3 | 3 |
| Pathology | 2 | 2 | 1 | 2 | 2 | 3 |
| Anthropology | 0 | 3 | 2 | 6 | 1 | 2 |
| Paleontology | 0 | 0 | 4 | 2 | 3 | 0 |
| Mineralogy | 0 | 0 | 0 | 1 | 0 | 0 |
| Metallurgy | 0 | 0 | 0 | 1 | 1 | 0 |
| Total | 273 | 234 | 241 | 309 | 332 | 328 |

THESES DISTRIBUTED ACCORDING TO SUBJECT

*Agriculture*

Cornell: Roy Glen Wiggans, "Classification of the cultivated varieties of barley." Daniel Scott Fox, "Analysis of the cost of growing potatoes." Frank App, "Farm profits on 370 potato farms in Monmouth, New Jersey."

Illinois: Jose Jison Miralsol, "Aluminum as a factor in soil acidity."

Minnesota: Paul Harmer, "Uniformity of the Late Gray Drift of Minnesota."

Wisconsin: William Merriott Gibbs, "Isolation and study of nitrifying bacteria." Tsunao Inomata, "Intensity of culture." Frederick Charles Bauer, I. "Effect of leaching on the availability of rock phosphate to corn." II. "Relation of organic matter and the feeding power of plants to the utilization of rock phosphate."

*Anatomy*

Chicago: Luther Sherman Ross, "Cytology of the large nerve cell of the crayfish (*Cambarus*)."

Cornell: Lyda May Degener, "Development of dentary bone and teeth in the lower jaw of *Amia calva*."

Harvard: Ralph Faust Shaner, "A study in comparative embryology."

*Anthropology*

Columbia: Leslie Spier, "The Sun Dance of the Plains Indians."

Harvard: Edward Smith Handy, 3d, "Polynesian religion."

*Astronomy*

California: Sophie Hazel Levy, "Theory of motion of the planet (175) Andromache." Charles Donald Shane, "The spectra of certain class N stars."

Chicago: Alice Hall Farnsworth, "Comparison of the photometric fields of the 6-inch doublet, 24-inch reflector, and 40-inch refractor with some investigation of the astrometric field of the reflector." Hannah Steele Pettit, "Proper motions and parallaxes of 359 stars in the cluster *h* Persei." Edison Pettit, "Form and motions of the solar prominences."

Michigan: Julia May Hawkes, "Photographic determination of the positions of stars and nebulous knote in and around the great nebula of Andromeda."

*Bacteriology*

California: Theodore Day Beckwith, "Studies upon the chemotherapy of the experimental typhoid carrier condition."

Chicago: Ida Albertina Bengtson, "The proteus group of organisms." Benjamin Junior Clawson, "Varieties of streptococci with special reference to constancy."

Harvard: Monroe Jacob Schlesinger, "The mechanism of antianaphylaxis."

New York: Hassow Otto Von Wedal, "Complement fixation test for tuberculosis."

Ohio State: Edward Everett Hale Boyer, "The chemical nature of the antigenic substances in Bacillus coli."

Yale: William Shelton Sturges, Jr., "Bacterial autolysis."

*Botany*

Brown: Eda May Round, "Carboniferous flora of Rhode Island."

California: Carl Hartley, "Damping-off in forest nurseries."

Chicago: Arthur Wing Haupt, "The life-history of *Fossombronia cristula*." Ladema Mary Langdon, "Stem anatomy of *Dioon spinulosum*." John James Willaman, "Function of vitamine in the metabolism of *Sclerotinia cinerea*." Dean Alvin Pack, "After-ripening and germination of juniper seeds." Scott Verne Eaton, "Sulfur content of soils and its relation to plant nutrition." Hope Sherman, "The respiration of dormant seeds." Perry Daniel Strausbaugh, "Study of dormancy in the plum." Helen Ashhurst Choate, "Study of certain chemical changes occurring in wheat during germination." Howard DeForrest, "Plant ecology of the Rock River Woodlands of Ogle County, Illinois."

Columbia: Frederick Vernon Rand, "The chloratic groups of plant diseases with special reference to pecan rosette." Robert Aaron Stemberg, "Stimulation of growth by zinc and ferric sulphates." Harvey Earl Thomas, "Relation of the health of the host and other factors to infection of *Opium graveolens* by *Septearia apiirosti*."

Cornell: William Henry Eyster, "Linkage relations of the factors for tunicate ear and starchy-sugary endosperm in maize." Ernest Gustaf Anderson, "Inheritance of salmon silk color in maize." Vining Campbell Dunlap, "Studies of development in the genus *Pleurotus*." Edwin Fraser Hopkins, "The botrytis blight of tulips." Harry E. Knowlton, "Studies in pollen." Roy David Anthony, "Sexual inheritance in the violet." Harvey Elmer Stork, "Biology, morphology and cytoplasmic structure of *Aleu-*

*rodiscus.*'' Harry Wilmer Dye, ''The bottom-rot and the stunt.'' Gordon Peter McRostie, ''Inheritance of disease resistance in the common bean.'' Frank Burkett Wann, ''Fixation of free nitrogen by green plants.''

GEORGE WASHINGTON: William Edwin Safford, ''Revision of the genus *Datura.*''

HARVARD: Oran Lee Raber, ''Effect of anions upon permeability.'' Alden True Speare, ''Morphology and reproduction of *Sorosporella uvella.*''

ILLINOIS: Lee Ellis Miles, ''Leaf spots of the elm.'' Mary Emma Renich, ''Growth as related to specific gravity and the size of seed.'' Edwin Rollin Spencer, ''Some of the causes of decay of Brazil nuts.'' Truman George Yuncker, ''Revision of the North American and West Indian species of *Cuscuta.*''

IOWA STATE: Beryl Taylor, ''Development of foliage leaves of *Vitus vulpina* L. and *Catalpa bignonoides* (Walt.).

JOHNS HOPKINS: William Ernest Seifriz, ''Structure and behavior of protoplasm as determined by the aid of microdissection.''

MICHIGAN: Ray Clarence Friesner, ''Daily rhythms of elongation and cell-division in certain roots.'' Frieda Cobb, ''Case of mendelian inheritance complicated by heterogametism and mutation in *Œnothera pratincola.*''

OHIO STATE: Swarna Kumer Mitra, ''Toxic and antagonistic effects of salts on *Saccharomyces ellipsoideus.*''

PENNSYLVANIA: William Randolph Taylor, ''Morphological and cytological study of reproduction in the genus *Acer.*'' Irwin Boeshore, ''Morphological continuity of Scrophulariaceæ and Orobanchaceæ.''

PITTSBURGH: Earnest Milton Gress, ''Grasses of Pennsylvania.''

RADCLIFFE: Matilda Moldenhauer Brooks, ''Quantitative studies on the respiration of *Bacillus subtilis* (Ehrenberg) Cohn.''

WISCONSIN: Clyde Melvin Woodworth, ''Inheritance studies in soy beans. I. Cotyledon, seed-coat, hilium, and pubescence colors.'' Bert Lorin Richards, Title of thesis not given. William Burley Tisdale, Title of thesis not given. Walter H. Snell, Title of thesis not given. Edward Eastman Clayton, ''Influence of certain environmental factors on the development of the fusarium wilt of tomatoes.'' Mabel Mary Brown, ''Distribution of sexual characters and regeneration in *Funaria hygrometrica* (L) Sibth.''

YALE: Julia Bayles Paton, ''Pollen and pollen enzymes.''

*Chemistry*

BROWN: Chester Lewis Knowles, ''Preparation of para dephenyl propiolic acid.''

CALIFORNIA: John Merritt McGee, ''Preparation and properties of sodium amide.'' Roy Frederick Newton, ''Equilibria in reactions of methyl alcohol with hydrochloric acid and with hydrobromic acid.'' George Sutton Parks, ''The specific heats of ethyl and propyl alcohols.''

CHICAGO: Ray Quincy Brewster, I. ''Symmetrical tetraprophylethane.'' II. ''Reduction of nitrotriphenylamine.'' Elvah Harley Grafton, ''The adsorption of benzene derivatives on the surface of water.'' Morris Selig Kharasch, ''Colors of the second order.'' George Elmer Miller. I. ''Preparation of pure cyanogen chloride. II. Preparation and study of d- and l-beta gamma diozybutyric acid.'' Charles H. Milligan, ''The preparation of d-l-P-methyl-isopropyl methyl-phenyl hydrazine. The isolation of pure d-P-methyl-isopropyl methyl-phenyl aniline.'' Henry John Rossbacher, ''M-tolyl-ethyl-barbituric acid.'' Karl Theodor Steik, ''The effect of alkali upon Portland cement.'' Roger John Williams, ''The vitamine requirement of yeast.'' Lathrop Emerson Roberts, ''A study of phase boundaries.'' Amando Clements, ''The relation between pore size and adsorption in charcoal.'' Mary Meda Rising, I. ''The preparation of phenylethylbarbituric acid. II. The preparation of para-ureido-phenylacetylurea and related compounds. III. An attempt to filter the enzymes of milk.'' John Edward Schott, I. ''Oxidation of benzamide. II. Derivatives of phenylethylbarbituric acid.'' Dwight Tarbell Ewing, I. ''The densities and adsorption and desorption properties of gas mask charcoals. II. The effects of acids and bases on the surface energy of B-B-dicolorethyl sulphide ('Mustard gas').'' Steward Basterfield, ''Derivatives of isourea and their pharmacological action.'' Ying Chang Cheng, ''Cohesion, adhesion, tensile strength, tensile energy, negative surface energy, interfacial tension, and molecular attraction.'' Frank Louis DeBeukelaer, ''Derivatives of phenylethylacetic acid and of phenyldiethylacetic acid.'' Warren Walter Ewing, ''Attractions of mercury for other liquid.'' Louis Melvin Larsen, I. ''Nitrotriphenylamines. II. Oxidation of diaminophenols.''

Cincinnati: Clarence Alonza Mills, "Distribution, nature and method of action of tissue coagulants."

Clark: Chung Yen Chiu, "Nature of the complexes formed between the alkali metals and certain heavy metals in liquid ammonia." Henry Cole Parker, "Conductance of iodic acid in aqueous solution."

Columbia: Eliz Brakelly, "Factors affecting the stability of addition compounds in solution and their influence upon viscosity." Paul Maymes Gross, "Factors affecting the stability of addition compounds in solution and their influence on ionization-equilibria." Theodore Clinton Taylor, "Fat associated with starch." Marguerite Wayman, "The effect of certain antiseptics upon the activity of amylases." Francis J. Fuchs, "Effect of foreign oxides upon the decomposition of silica oxide, mercuric oxide and barium peroxide." Paul M. Giesy, "Chemical study of the placental harmone." Mary Louise Landon, "Formation of addition compounds between 100 per cent. sulphuric acid and the neutral sulphates of the alkali metals." Ida Pauline Rolf, "Contributions to the chemistry of the unsaturated phosphatids."

Cornell: Frank William Douglas, "Chemistry of germanium." Ralph W. G. Wyckoff, "Crystal structures of cassium dichloroiodide and of sodium nitrate." Major Edward Holmes, "Contributions to the chemistry of the hydronitrogens and pernitrides."

George Washington: Elias Elvove, "The detection and estimation of small amounts of organic nitro compounds with special reference to the examination of the urine of TNT workers." Edward Elmer Smith, "The effects of bleaching with oxides of nitrogen upon the baking qualities and commercial value of wheat flour." Peter John Donk, "A thermophilic bacterium causing flat-sour in canned goods."

Harvard: Edward Adelbert Doisy, "Determination of sodium, potassium and chlorine in small samples of tissue." Webster Newton Jones, I. "Study of 1, 2-dibenzoyl-3-phenylcyclopane. II. 1-Iod-2, 4, 6-tribrom-3-nitrobenzene. III. 2, 2, 3-trimethylpentane." Alexander Donald Macdonald, "Addition of phosphorus trichloride to saturated aldehydes and ketones." David Robert Merrill, I. "On catalytic oxidation. II. On certain cyclopropane derivatives."

Illinois: Miner Manly Austin, "Potash in Illinois shales." Herbert Ephraim French, "Preparation of substituted alpha halogen benzyl benzoates, and a study of the reactions of these compounds." Ralph William Hufferd, "Application of Victor Meyer's esterification law to neighboring xylic acid and its reduced derivatives." Carl Shipp Marvel, "Study of the possible asymmetry of the aliphatic diazo compounds." Ruth Evelyn Merling, "Methods of arylaton." Sargent Gastman Powell, "Unsaturated phenyl ethers and their rearrangements." Lynne Herman Ulich, "Reactions between acid halides and aldehydes." William Alexander Van Winkle, "Study of the determination of the halogens in volatile organic compounds."

Johns Hopkins: Frederick Keller Bell, "Effect of copper on the solubility of iron in acids." Charles Edward Lanning, "Study of an oxidizing catalyst." Edward Otis Holmes, Jr., "Action of ultra-violet light on gels." Frederick Collins Lee, "Electrolytic preparation of ammonium permanganate." Paul Lange Lotz, "Osmotic pressure of sucrose 30° and 55°.7 as determined by the water interferometer." George Edgar Miller, "Anthraquinone, 1, 8 aliphatic thioether-sulphonic acids and di-thio-ethers." Colin MacKenzie MacKall, "Anthraquinone 1, 5 aliphatic thioether-sulphonic acids and di-thio-ethers." Charles Snowden Poggott, "Catalytic oxidation of ammonia." Lloyd Hilton Reyerson, "Nature of the interfaces existing in the pores of silica gel and the retention of bromine by silica gels." Thomas Cobb Whitner, Jr., "Study of the reactions of normal butyl mercaptan and some of its derivatives."

Massachusetts: James Alexander Beattie, "Investigations in the electromotive forces of concentration cells of lithium and potassium chlorides." Ming Chow, "Investigations in the electromotive forces of concentration cells of potassium hydroxide, and on the activities of ions in mixed electrolytes." Yu Liang Yeh, "Investigations of liquid junction potentials, and on the activities of ions in mixed electrolytes." Charles Ernest Ruby, "Investigations of the equilibria and free energies of mixtures of manganate, permanaganate, and hydroxide of potassium and manganese dioxide."

Michigan: Dorothy Hall, "Separation of copper and cobalt by phenythiohydantoic acid and the volumetric determination of cobalt." Earl Grover Sturdevant, "Electrodeposition of brass from cyanide solutions."

New York: Irene Caroliner Diner, "Microscopic examination of rubber and rubber products."

Ohio State: Frank Carl Vilbrandt, "Oxidation of

methane.'' Melvin Guy Mellon, ''Further study of a lead standard cell.''

PITTSBURGH: Emil Harold Balz, ''Derivatives of 2, 4, 6, trinitrobenzaldehyde.''

PRINCETON: Arthur Ferguson Benton, ''Gas flow meters and the end correction in the determination of gas viscosity by the capillary tube method.'' Homer Hiram Lowry, ''Studies in the absorption by charcoal.'' Merwyn Clarence Teague, ''Efficiency, testing and improvement of gas warfare box respirators.''

VIRGINIA: Judson Hall Robertson, ''Hydrolysis and heat of formation of urea sulphate, and the relation of these factors to the decomposition of urea into ammonia and carbon dioxide in aqueous solutions.''

WISCONSIN: George J. Ritter, ''Catalytic hydrogenation of cotton seed oil.'' Van Lorens Bohnson, ''Contribution to the study of the catalytic decomposition of hydrogen peroxide.'' Barnett Sure, Title of thesis not given. Wallace Headen Strowd, ''Studies in the nitrogen metabolism of the soy bean.'' Daniel Christopher Leander Sherk, ''Thymol and carvacrol problems in connection with the Monardas.'' George Robert Shaw, ''Chemistry of platinum at high temperatures and pressures.'' Clifford Shattuck Leonard, Title of thesis not given. Clinton B. Clevenger, I. ''The accurate determination of the hydrogen-ion concentration of plant juices by means of the hydrogen electrode. II. Factors affecting the acidity of hydrogen-ion concentration of plant juices.''

YALE: Charles Barkebus, ''Some constituents of *Viburnum Prunifolium* or Black Haw.'' Stuart Robert Brinkley, ''Equilibrium in the system ammonia-ammonium nitrate-ammonium thiocyanate.'' Florian Anton Cajori, ''Nutritive properties of nuts.'' John Joseph Donleavy, ''Alkylation of aromatic amines by interaction with aliphatic alcohols.'' Jacob Benjamin Fishman, ''New derivatives of benzylalcohol possessing possible therapeutic interests.'' Martha Richardson Jones, ''Studies on carbohydrate metabolism in rabbits.'' Frederick William Lane, ''Study of certain alkyl derivatives of resorcinol and their value as antiseptics.'' Walter Gerald Karr, ''Studies on nutrition.'' Icie Gertrude Macy, ''Comparative studies on the physiological value and toxicity of cotton seed and some of its products.'' Lyman Edwards Porter, ''Analytical chemistry of gallium.'' George Walter Pucher, ''Development of the intermediate stages of a new method of synthesizing histamine.'' Arthur Henry Smith, ''Effect of solutions of certain salts and colloids on the permeability of the capillary walls.''

CALLIE HULL,
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RESEARCH INFORMATION SERVICE,
NATIONAL RESEARCH COUNCIL

(*To be concluded*)

## THE LOW TEMPERATURE LABORATORY OF THE BUREAU OF MINES

ON June 17, 1920, Professor J. C. McLennan, of the University of Toronto, gave a lecture before the Chemical Society in London, on "Helium, Its Production and Uses." This lecture has been printed in the July, 1920, number of the *Journal of the Chemical Society*. At the close of his lecture Professor McLennan gave special emphasis to the great need of a properly equipped cryogenic laboratory somewhere within the British empire. To quote his own words:

> The list of problems rendered capable of attack by the use of liquid helium might be easily extended, but those cited already will serve to show that the field is large and that it is well worth while for us to make a special effort to secure adequate financial support for the equipment and maintenance of a cryogenic laboratory within the Empire. It is probably beyond the ordinary resources of any university to equip and maintain such a laboratory, but the project is one which merits national and probably imperial support. It should appeal to private beneficence as well for it is a project deserving strong and sympathetic help.

It may be of interest to American scientists to know that the need of such a laboratory in this country was recognized by the Bureau of Mines more than a year ago. The immediate need was for the obtaining of certain scientific data which is necessary for the improvement and development of the commercial work in connection with the government helium plants, but there is a large field outside of this immediate need which can be covered by such a laboratory.

Through the interest and broadmindedness of Commander A. K. Atkins, of the Navy, and Colonel C. DeF. Chandler and Lieutenant R.

S. Olmsted, of the Army Air Service, necessary funds for the purchase of equipment and the maintenance of this laboratory were furnished to the Bureau of Mines late last spring. This equipment is now being received and installed by the Bureau of Mines in the New Department of the Interior Building at Washington. The equipment consists of two four-stage Norwalk compressors with a capacity of 75 cu. ft. of free air per minute each. These will be used for making liquid air and for other purposes in connection with the experimental work. There will also be one vertical submarine type Norwalk compressor with a capacity of 12 cu. ft. of free air per minute to be used in connection with a liquid hydrogen cycle, and a similar compressor with a capacity of 8 cu. ft. of free air per minute for use in connection with a liquid helium cycle. These compressors will all be driven by variable speed motors, and be equipped with unloading valves so that the capacities can be varied within wide limits. In addition, there will be an adequate equipment of gas holders, a machine shop, and a chemical and physical laboratory. The force will consist of four technical men and two mechanics, and the whole laboratory will be under the direction of the writer. It is hoped that the equipment will be completely installed by January 1.

Whereas the main object of the laboratory will be to assist in every possible way the whole helium project, both on the production and refining ends, there is a strong desire that this laboratory shall be of material use to science in general, and that it may be possible later on to make arrangements for its facilities to be used in special cases by men outside the government service who are specially equipped for such work.

R. B. Moore

## SCIENTIFIC EVENTS

### PHOSPHATE IN MOROCCO

In times of peace this country, according to the Geological Survey, has in a single year sent abroad, mostly to Europe, 1,250,000 long tons or more of high-grade phosphate rock, or more than 40 per cent. of its total annual output. The exports decreased during the war until, in 1918, they amounted to only 143,000 tons, or 6 per cent. of the domestic output. They increased to 379,000 tons in 1919, but these reports of newly discovered large deposits in Morocco, which, like those in Algeria and Tunis, are near to the large fertilizer market in southern Europe, may mean that the American exporter of phosphate rock will have formidable competition in that region.

As superphosphate fertilizer is manufactured chiefly from phosphate rock, France, by her control of the deposits in Algeria, Tunis and Morocco, has a practical monopoly of the North African sources of a commodity that is essential to the restoration of European agriculture. When these deposits have been further developed and adequate transportation facilities have been provided the market for phosphate rock in southern Europe will probably be supplied from northern Africa, so that the American exports to Europe will be confined to the northern countries.

The principal deposits in Morocco are about 80 miles southeast of Casablanca and consist of three beds or series of beds of phosphatic sand in a formation that is 50 to 200 feet thick. The uppermost phosphatic bed contains 67 per cent. of tricalcium phosphate, the middle bed 30 per cent. and the lower beds 53 per cent., and the commercial average for the group is about 59 per cent. Water and hydroelectric power for the exploiting of the deposits can be obtained from a river near by. In order to market the rock, however, a railroad would have to be built from the deposits to Casablanca, the nearest port.

Another deposit, which consists of soft phosphatic material carrying 72 to 75 per cent. of tricalcium phosphate, lies 40 miles northeast of the principal one. Still another deposit lies a short distance southeast of Rabat, a coast town. This deposit consists of sandy clay 16 feet thick containing nearly 47 per cent. of tricalcium phosphate.

### THE PASTEUR INSTITUTE OF PARIS

The Paris correspondent of the *Journal* of the American Medical Association writes:

A touching appeal for the cause of microbiologic research was recently made by Dr. Charles Nicolle, director of the Pasteur Institute of Tunis, in a letter published in the *Temps*. He had just completed a stay of two months in France, and he returned appalled at the conditions which he found. The country which has produced Pasteur, Duclaux, Laveran and Roux, to mention only a few of the more illustrious scientists, and which received Metchnikoff with open arms, without the least compunction is permitting the decline of a science that has given France a large part of her past glory and from which she has always derived the first benefits.

Nicolle admits that it would be unfair to demand that the state support the laboratories, especially at the present time. However, he thinks that it is not the teaching laboratories from which we should expect to see great discoveries come forth: he who teaches is an erudite, while the mentality of the research worker is entirely different, and it is through other than teaching institutions that all real progress in microbiology must come. The typical institution of this kind in France and the one most widely known is the Pasteur Institute of Paris, the parent establishment whose offspring may be found in France, the colonies and abroad. The Pasteur Institute is a private establishment and does not serve as a teaching medium. The members of its staff devote all their efforts to scientific investigations, and in the thirty-five years of their endeavors they have shown marked ability. The institute derives its income from the sale of biologic products and from donations, and to-day neither of these sources furnishes ample means. Not having the inexhaustible resources of the government back of it, it is now merely vegetating, and it is only by a miracle that more can be accomplished.

Nicolle, therefore, addresses to the public an appeal for support of the microbiologic laboratories, pointing out that the matter should be of special interest to the farmers, for instance, for it makes possible a continuation of the researches on aphthous fever, a disease that has been responsible for the loss of millions and constitutes a permanent menace to agriculture. On the other hand, Nicolle calls attention to the difficulty of inducing young men to enter the laboratories, for the small budgets make a career in a laboratory anything but profitable.

## THE BRITISH MINISTRY OF AGRICULTURE

*Nature* states that changes are announced at the British Ministry of Agriculture, the effect of which is the promotion of Mr. F. C. L. Floud to be permanent secretary and the liberation of Sir Daniel Hall from office work so that he will be able to keep in close personal touch with agricultural developments and devote his whole time to the organization of agricultural education and research. The scheme now in operation comprises four essential parts: (1) Research institutions, where knowledge is gained and agricultural science systematically developed and put into such form that teachers and experts can use it. At first this work was distributed among a number of university departments, but of recent years there has been a tendency to concentrate it at a few institutions owing to the necessity for bringing individual workers into closer personal contact with each other and with the large-scale problems of the farmer. (2) Agricultural colleges, where experts and large farmers will be trained, receiving a three years' course of instruction of university character. Most of these colleges are associated with universities which award degrees in agriculture; for students who do not wish to take degrees there is a diploma course requiring a high standard of technical work. (3) Farm institutes for small farmers and farm-workers who can not spare three years for college, but have some practical knowledge and are unable or unwilling to go through the ordinary college course. These institutes aim at giving sound courses of instruction on soil, manure, crops, animal husbandry, etc., but it is usually presumed that the student will take up farming in the area served by the institution, and for which the instruction is specially appropriate. (4) Advisory officers. In each county arrangements are made whereby farmers, smallholders, and others may consult the agricultural expert appointed by the county authority in regard to any difficulties they may meet with in their work. The expert is in a position somewhat similar to that of the general medical practitioner, and usually finds that he can deal with a large number of the cases presented to him. He is, however, in touch with the colleges, research institutions, etc.,

and can always obtain expert advice in any particular problem of special difficulty.

### COLLECTION OF BIRDS FOR THE CALIFORNIA ACADEMY OF SCIENCES

Another well-known ornithological collection has been added to the rapidly increasing collections in the Museum of the California Academy of Sciences, San Francisco, California—the W. Otto Emerson collection.

Mr. Emerson began his bird studies in California some forty years ago, at that time laying the foundation of one of the most complete local collections of birds assembled in this state. His studies have been maintained in his spare time to the present date, and the results of his bird studies and observations are apparent in his notes and carefully selected series of specimens of local species. As Mr. Emerson has lived at Hayward, Alameda county, California, practically all of this period, his collection and notes have especial value from the standpoint of local occurrences, distribution, changes, etc.

In this collection are some most useful series of ducks in the first stage of juvenile plumage, carefully identified, which, added to such material as is adready in the academy collection, will be of much value for comparisons, and the study of plumage. Besides the series of birds of especial local value, there are a good series of warblers from various parts of the United States, and some rare records from California in the line of warblers, and some original record specimens for the state of several species of sparrows, etc.

The academy suffered the loss of its very valuable collection of birds in the fire of 1906, and, while the series of sea and shore birds has been more than replaced, the land birds have had but little effort expended upon them. The addition of the Emerson and Mailliard collections, which consist principally of land birds, has very materially assisted in bringing the academy collection nearer to its old basis.

In addition to the collection of bird skins, some valuable manuscripts of Dr. James G. Cooper, such as those of "The Ornithology of California, Land Birds, 1870," and "The Birds of Washington Territory, 1860-65," together with some of Dr. Cooper's note books, dating back to 1853, have accompanied the collection.

### THE GEOLOGICAL SOCIETY OF AMERICA

The thirty-third annual meeting of the Geological Society of America will be held Tuesday to Thursday, December 28 to 30, at Chicago by invitation of the University of Chicago and in affiliation with the American Association for the Advancement of Science. The scientific sessions will be held in Rosenwald Hall on the university campus.

The address of the retiring president, Dr. I. C. White, will be delivered in the Reynolds Club building at 8 o'clock P.M., Tuesday, December 28, 1920. The annual subscription smoker will be held at the Reynolds Club at the conclusion of President White's address. Tickets, $1.00 each. The annual subscription dinner will be held at the Chicago Beach Hotel, 51st Street and Lake Michigan, Wednesday evening, December 29, at 7 o'clock. Hotel headquarters will be established at the Chicago Beach Hotel.

The Paleontological Society will hold its twelfth annual meeting at Chicago in conjunction with the Geological Society of America. Full information regarding this meeting may be obtained, as usual, from the society's secretary, Dr. R. S. Bassler, U. S. National Museum, Washington, D. C.

The Mineralogical Society of America will hold its second annual meeting at Chicago in conjunction with the Geological Society of America. Full information regarding this meeting may be obtained from the society's secretary, Mr. H. P. Whitlock, American Museum of Natural History, New York City.

The Society of Economic Geologists will hold its initial meeting at Chicago in conjunction with the Geological Society of America. For further information regarding this meeting, address Professor J. Volney Lewis, secretary, New Brunswick, N. J.

Edmund Otis Hovey,
*Secretary*
American Museum of Natural History,
New York,

## SCIENTIFIC NOTES AND NEWS

ACCORDING to a cablegram from Stockholm to the daily press, Charles Edouard Guillaume Breteuil, head of the International Bureau of Weights and Measures, was awarded the Nobel prize in physics for 1920 on November 11 by the Swedish Academy of Science. The prize in chemistry has been awarded to Professor Adolf Ossian Aschan, of Helsingfors University in recognition of his researches in connection with the production of synthetic rubber. The award of Nobel prizes to Professor Jules Bordet, of Brussels, and Professor August Krogh, of Copenhagen, has been recorded in SCIENCE, but, following a press despatch, the subject of Professor Krogh's work was incorrectly given. He is professor of animal physiology at the University of Copenhagen and was a pioneer in the study of the forces governing gas exchange in the lungs and other parts of the body. Professor Bordet is now lecturing in this country on immunology and anaphylaxis. He has given the Herter lectures at the Johns Hopkins University, the Cutter lecture at Harvard University, a Hanna lecture at Western Reserve University and will give shortly a course of Hitchcock lectures at the University of California.

DR. THOMAS F. HUNT, dean of the college of agriculture of the University of California, Leon M. Estabrook, statistician and chief of the Bureau of Crop Estimates of the United States Department of Agriculture and Harvey J. Sconce, of Sidell, Ill., were appointed delegates from the United States to the general assembly of the International Institute of Agriculture at Rome, November 3–15. Dean Hunt, who has been appointed permanent delegate to succeed David Lubin, is in Europe on sabbatical leave from the university, and reached Rome in time to take part in the meeting.

DR. J. H. WHITE, assistant surgeon general and Surgeon G. N. Guiteras have been designated by Surgeon General Cumming to represent the United States at the sixth International Sanitary Conference to be held at Montevideo, Uruguay, on December 19 and 20.

SURGEON-GENERAL M. W. IRELAND, U. S. Army, has been appointed a member of the Council on Medical Education, of the American Medical Association to succeed the late Dr. Isador Dyer, of Tulane University.

THE appointment of T. W. Norcross as chief engineer of the Forest Service is announced by Colonel W. B. Greeley, head of the service. Mr. Norcross succeeds Mr. O. C. Merrill, who resigned to become executive secretary of the Federal Power Commission.

MR. F. R. COLE, of Stanford University, has been appointed associate curator in dipterology, and Mr. Chase Littlejohn, of Redwood City, California, assistant curator in ornithology, in the Museum of the California Academy of Sciences, San Francisco.

ACCORDING to the *Journal* of the Washington Academy of Sciences Mr. P. C. Holdt has been appointed research associate at the Bureau of Standards, by the American Paint and Varnish Manufacturers' Association, and Mr. E. J. Ruh by the International Nickel Company.

DR. NORAH E. DOWELL, instructor in geology at Smith College, has been appointed assistant geologist in the U. S. Geological Survey for duty as office geologist and research assistant in the Ground Water Division.

JOHN W. CALVIN, professor of chemistry at the University of Nebraska and associate chemist in the station, has become chemist in the experiment station of the Dominican Republic.

J. C. MCNUTT has resigned as head of the department of animal husbandry in the Massachusetts College to become eastern representative of the American Shorthorn Breeders' Association, with headquarters at Amherst.

DR. DOUGLAS R. SEMMES, professor of geology at the University of Alabama, has resigned his work at the university and accepted the position of assistant chief geologist of the Compañia Mexicana de Petroleo, "El Aguila," and will be located permanently at the company's headquarters in Tampico.

AFTER twenty-five years of active service in teaching and research work in applied chemis-

try and chemical engineering at the Massachusetts Institute of Technology, Dr. William H. Walker has tendered his resignation as director of the Division of Industrial Cooperation and Research to take effect on January 1. He will resume his consulting practise which was interrupted in 1917 by his entering the service, and, although no longer officially connected with the institute, will maintain his interest in the development of the division and will closely cooperate with it in the fulfilment of the contracts under the Technology Plan already existing. This division acts for the Institute of Technology in the administration of its obligation incurred under the Technology Plan by which over 200 of the most prominent industries of the country have made contracts involving annual retainer fees of over a quarter million dollars. He will be succeeded by Professor Charles L. Norton, professor of industrial physics at the institute and director of the Research Laboratory of Industrial Physics.

The *Journal* of the American Medical Association quoting from the *Deutsche medizinische Wochenschrift* states that the Vienna physiologist, Professor E. Steinach, is intending to remove to Stockholm, where he will continue his research on physiology and biology.

The *Journal* of the Washington Academy of Sciences reports the following foreign visitors to Washington: Dr. R. J. Tillyard, director of the Cawthron Institute of Scientific Research at Nelson, New Zealand; Dr. T. Harvey Johnston, of Queensland, who is on a mission to various parts of North and South America for the purpose of studying the cactus and means of controlling it, and Mr. A. K. Haagner, director of the zoological park at Pretoria, South Africa, who came to the United States in charge of a shipload of African animals which had been collected at Pretoria during the war for various American zoological parks.

Dr. W. E. S. Turner, secretary of the Society of Glass Technology, the University of Sheffield, England, and forty members of the society recently made a tour of the glass centers in America.

W. P. Wooding with a party from the United States Geological Survey have left for Haiti to conduct a reconnaissance geologic examination of the Republic of Haiti at the request of that government.

The University of California has secured Mr. Bert A. Rudolph, a pathologist in the United States Department of Agriculture at Washington and a graduate of the State University, to develop further tests of control of apricot brown rot by spraying in the spring. The work will be carried on at the deciduous fruit station of the university and at Mountain View.

Winthrop P. Haynes, associate professor of geology at the University of Kansas, Lawrence, is on leave of absence for a year and is with the foreign production department of the Standard Oil Company of New Jersey. He will spend most of the winter with a geological surveying party in Mexico.

Dr. A. C. Trowbridge, professor of geology at the State University of Iowa, gave an address, November 3, as retiring president of the Iowa Chapter of the Society of Sigma Xi, "On the importance of sedimentation: a neglected phase of geological investigation."

Dr. Raymond Pearl, of the Johns Hopkins University, on November 11, gave the Gross Lecture before the Philadelphia Pathological Society on "Some biological aspects of human mortality."

Professor Ulric Dahlgren, of Princeton University, delivered a lecture, on November 1, before the Franklin Institute of Philadelphia, on "The production of motion by animals."

Dr. Nellis B. Foster, of the Cornell Medical College, will deliver the third Harvey lecture at the New York Academy of Medicine, Saturday evening, November 20. His subject will be "Uræmia"

It is announced in *Nature* that a course of three public lectures on "Present Tendencies of Philosophy in America," at King's College,

London, beginning on October 28 with a lecture on "New realism: its background and origin," was given by Professor W. P. Montague, professor of philosophy in Columbia University, New York City. The two other lectures were entitled: "New realism: its implication and promise," and on November 1, Professor J. E. Boodin, professor at Carleton College, Minn., gave a lecture on "Pragmatism: its right and left wings."

THE University of Bologna and the Royal Academy of Sciences held a joint commemoration service for the late Professor Righi on November 1, when an address was delivered by Professor Luigi Donati.

A GOLD medal, studded with diamonds, but valued chiefly because it had been "presented to Dr. S. D. Gross by his medical friends in commemoration of his fifty-first year in the profession, April 10, 1879," was recently given to Dr. J. Chalmers DaCosta, S. D. Gross professor of surgery at Jefferson Medical College, to be placed in the Jefferson College Museum.

PROFESSOR SAMUEL HANAWAY, who retired on account of health in 1916 from the department of mathematics in the College of the City of New York, has died at the age of 66.

M. H. P. STEENSBY, professor of geography at the University of Copenhagen, who was forty-five years old, died suddenly on board the liner *Frederik VIII.*, while returning from America, where he had been in connection with his investigations into the voyages of the old Norsemen to the coast of North America.

THE College of Physicians of Philadelphia announces that the next award of the Alvarenga Prize, amounting to about $250, will be made, July 14, 1921, provided that an essay deemed worthy of the prize shall have been offered.

PROFESSOR W. C. ALLEE, secretary-treasurer, of the American Society of Zoologists, writes that the committee on hotel accommodations for the Chicago meetings have assigned the American Society of Zoologists to the Congress Hotel, Michigan Blvd. and Congress St. The rates range from $3.00 to $9.00 for single rooms and from $7.00 up for double rooms. This hotel is the headquarters for the American Association and for the biological societies and members are accordingly urged to reserve rooms at their earliest convenience. Members of the zoologists desiring less expensive rooms may make reservations in the relatively nearby Y. M. C. A. Hotel at 822 S. Wabash Avenue before December 1. Rates: 70 cents, 80 cents and one dollar.

THE publication of *World Agriculture* as the official organ of the American E. F. Farmers' Club and the World Agricultural Society, is announced in the *Experiment Station Record.* It will be issued quarterly from Amherst, Mass. The purposes of the magazine are announced as follows: To further a sympathetic understanding among all nations in matters relating to the production, distribution and consumption of the products of the soil; to encourage study of the principles which should control the agricultural policies of the world to the end that every individual may do his full duty and may enjoy his rightful share of the results; to aid in the application of these principles through the dissemination of information, the exchange of students and teachers between educational institutions, and the rendering of practical assistance in the agricultural regions devastated by the world war and wherever such assistance is needed; to promote the correlation on world lines of all agencies concerned in rural improvement, technical, scientific, economic and social, and a greater appreciation of the possibilities of the country for the development of the highest types of individual and social life. In addition to the World Agriculture Society the journal expects to print official items regarding the International Institute of Agriculture, the American E. F. Farmers' Club, American Country Life Association, the International Live Stock Breeders' Association, the Beaune Committtee on World Cooperation in Agriculture and Country Life, the International Association of Agricultural Missions, the Agricultural Club of the North Carolina College, and the Agricultural Society of France. The June issue contains the officers of these organizations; reports of the Beaune conference of 1919, and

the Belgian national conference, and of the International Association of Agricultural Missions of 1920; a memorandum presented to the Peace Conference on World Agricultural Principles by President K. L. Butterfield, of the Massachusetts Agricultural College; a tribute to the late David Lubin; Some Impressions of French Agriculture by Captain E. N. Wentworth, assistant director of the college of agriculture, American E. F. University; the State Society of Agricultural Teaching in France, by G. Wery, director of the National Institute of Agronomy; several shorter articles relative to the reconstruction of French agriculture; and other topics.

## UNIVERSITY AND EDUCATIONAL NEWS

Offers of support and financial assistance towards the establishment of an agricultural college of university rank in the West Indies have been received from Trinidad, Barbados, Grenada, St. Lucia, St. Vincent, and the Leeward Islands, while Bermuda, although not in the West Indies, has offered an annual grant. On the recommendation of the West Indian Agricultural College Committee, Lord Milner has decided that the promises and prospects of support are sufficient to justify him in proceeding with the necessary arrangements for the establishment of the college. It will be situated in Trinidad, and plans for the buildings will shortly be prepared.

Part of the $5,000,000 expected to be realized from a campaign for McGill University, Montreal, will be devoted to a building to house the departments of pathology, medical jurisprudence, hygiene and psychiatry. It is estimated that such a building would cost at least $460,000, and its maintenance would require an endowment of $150,000.

At the college of engineering of the University of Wisconsin, A. A. Neff, graduate of the University of Nebraska, has been appointed associate professor of machine designing, and A. H. Anderson, of the Armour Institute of Technology, Chicago, associate professor of steam and gas engineering.

Dr. B. J. Spence, professor of physics at the University of North Dakota, has resigned to accept a position in the department of physics of Northwestern University.

J. H. Gourley, professor of horticulture in the New Hampshire College, has become head of the horticultural department of the University of West Virginia.

## DISCUSSION AND CORRESPONDENCE

### AN UNFAVORABLE SPAWNING SEASON FOR MULLET

The mullet, *Mugil cephalus* Linnæus, known as *ama-ama* in the native language, is one of the most extensively used food fishes of the Hawaiian Islands. The custom of taking very young mullet from the sea and stocking ponds with them has been practised for a long time. These ponds, usually walled-off arms of bays, are frequently of several acres in area and from them are taken annually thousands of mullet which have developed to marketable size within these enclosures.

Although a well-known fish, aside from the fact that the fishermen have learned to know the approximate time of the year when the fry are abundant in the sea, no definite information is at hand relative to the spawning season of the mullet or the conditions favorable to this process or to its later growth and development in these waters.

With a view of undertaking artificial propagation of the mullet the Board of Fish and Game Commissioners of the Territory delegated Mr. H. L. Kelley, executive officer, assisted by Mr. Irwin H. Wilson, fish culturist, to establish a small fish hatchery at Kalahuipuaa, Hawaii, which was completed early in January of the present year. From observations during previous years it was believed that the mullet spawned during January. In the pond on which the hatchery was located it was estimated that there were approximately 1,000 mature females approaching the period of spawning and nearly as many mature males. Careful observations were kept upon the condition of the mullet throughout January and February but no indications of spawning were to be seen. Attempts were made to force the

roe and milt from the apparently ripe individuals. This was accomplished on two occasions but all efforts to fertilize the eggs thus obtained were futile.

Early in March the fish began to take on the appearance of being spawned out, but not having observed spawn or young fish in the pond up to this time, anatomical examinations were made of numerous mullet, both males and females being dissected.

In case of many of the females, the ovaries although greatly reduced were not spawned out but contained ova which evidently at one time were mature but now were in a state of semi-dissolution.

In case of the males, many of them carried gonads shriveled and reduced in size but having no appearance of organs after spawning. The surface of the testes, in many instances, were thickly covered with rounded nodules from 2–5 mm. in diameter. In sectioning portions of the organs thus affected masses of cells of a greenish-yellow tint, by transmitted light, were seen to occupy the nodules and penetrate deeply into the medullary substance of the gland. These masses, of definite outline, have the appearance of broken down tissue cells of the spermary but maintain their characteristic color under the action of such stains as iron hæmatoxylin and methylen blue. Healthy gonads free from the external nodules are also free from the internal masses of cells.

Inasmuch as a considerable number of individuals examined were affected in the manner described above we are led to believe that the noticeable scarcity of young mullet this season is a result of a pathogenic condition of the reproductive organs of mature individuals which inhibited spawning. The cause of this condition has not yet been determined.

Failure of the mullet to spawn in the usual prolific manner seems general throughout the Hawaiian Islands this season. The testimony of fishermen from widely separated districts is that there are comparatively few young mullet to be taken this year. One fisherman on Oahu reports that he has been able to take less than 2,000 fry for his ponds whereas in previous years he has taken as many as 900,000 from the same waters during a similar period. Another fisherman stated that he had taken about 6,000 as contrasted with 250,000 last year. A report from Kauai states that no mullet fry are observed in waters which in normal years are teeming with them.

From personal observations of those closely identified with the work of the Fish and Game Commission and from information received from reliable sources it would appear that the season just passed has been an unfavorable one for the spawning of mullet in these waters.

Further attempts will be made by the Board of Fish and Game Commissioners to carry on artificial propagation and culture of this important food fish.

C. H. EDMONDSON

UNIVERSITY OF HAWAII,

## REMARK ON FAMILY NAMES

THE rules drawn up by Dr. Oberholzer[1] for the formation of family and subfamily names, seem to be very good in most respects, but in regard to that relating to family names founded upon almost identical names of genera, I must record my inability to concur. Under Rule 13, the author states that of two family or subfamily names having "exactly the same spelling," the latter is to be distinguished from the earlier by the prefix "*Pro,*" and subsequently gives as an example the family names derived from *Pica* and *Picus,* proposing for one of them the name Propicidæ. According to all accepted rules for the formation of family names, this would indicate that there is a genus *Propica* or *Propicus,* which of course is untrue.

It would be much better in such a case as this to modify the generic root names in a slightly different way to form the family names, and that founded upon *Pica* might be Picidæ, using Picusidæ for that having *Picus* as the type. In forming the family name from that of the genus custom has differed in some instances; for example, in the Coleoptera, the generic word *Cis* has given rise to the family name Cioidæ in the case of some authors and

[1] SCIENCE, August 13.

Cisidæ with others. Personally, I would much prefer the latter as the permanent form for the word.

Thos. L. Casey

## RESEARCH PROBLEMS "ASSIGNED TO" UNIVERSITY PROFESSORS AND THEIR STUDENTS

A paper on North American Forest Research[1] has recently been issued, giving a résumé of the "Investigative Projects in Forestry and Allied Subjects Conducted by National, State and Provincial Governments, Schools of Forestry, Scientific Schools and Private Interests in Canada, Newfoundland and the United States for 1919–20."

More than five hundred projects are enumerated, nearly half of them under investigation by persons in departments of the United States government. Many of the remainder are concerned with the activities of various state agencies and institutions, while a number represent research undertaken by professors and their students in various colleges and universities.

The compilers of this list have very carefully indicated in connection with each project, by whom it is being investigated, nearly always stating that it is "assigned to" some individual or group of persons. For example, under certain universities and colleges, we find numerous projects "assigned to" various members of their faculties and in certain cases secondarily to their students.

I think we may legitimately inquire by whom these problems have been assigned to the persons named. Certainly not by the National Research Council, not by the Society of American Foresters, not by our colleagues, and usually not by any of the governing boards of the universities and colleges.

Such wording, like the repeated use of "control" and "direction," conveys the imputation that men of science do not select and elaborate their own lines of research, and it is very unfortunate that it should appear in such a journal as the *Bulletin* of the National Research Council. Let us hope that the council does not stand sponsor for it, for it does not seem likely that it will aid in attaining the closer cooperation which independent workers hope to see as a result of the operations of the Research Council. It is better to believe that the printer or the proofreader has inserted this stereotyped phrase as it appears quite regularly, and no doubt properly so, in connection with many of the bureaus and governmental agencies. In view of the increasing extension of the bureaucratic spirit into scientific work, perhaps all research must be assigned by some one other than he who performs it, and possibly problems should not be outlined by those who investigate them. Until such comes to pass, however, it seems unjustifiable that research in forestry or in any other subject should be thrust into the lime-light with such carelessly worded captions attached.

C. T. Brues

[1] Compiled by the Committee on American Forest Research, Society of American Foresters, and published as Vol. 1, Pt. 4, of the *Bulletin* of the National Research Council, August, 1920.

## THE LAWS OF HYBRIDIZING DISCOVERED BY RICHARD DIENER

The above is the title of a booklet of some sixteen pages, dated (with a rubber stamp) as issued July 1, 1920, and coming, appropriately, from California, the home of plant wizardry. The discoverer states that it has taken thousands of crosses and fifteen years of time to perfect the laws which he is now giving to mankind—for a consideration. Their presentation is a delightful example of simplicity; the reader is not troubled with tiresome descriptions of methods or measures taken to check the results; the pages are not rendered unsightly by arrays of tables, nor is the intellect taxed by incomprehensible statistics, as is so often the case in present-day treatises on this subject. On the contrary the author has not needed all of his sixteen pages for the exposition; besides the title page he is able to spare one for a full-page portrait of himself, five pages are given to photographs of results of his labors, while a double-page diagram sets forth his laws so clearly that

one feels the text might really have been dispensed with entirely.

Nevertheless there are six and one half pages of text, three of which, however, are occupied by a philosophical discussion of "What plant life is," the nature of "Sports," and "Animal life in relation to plant life." The relation of these introductory remarks to the laws that follow is not clear; they nevertheless contain contributions to the subject of evolution which are novel, and their inclusion was presumably considered justified on their own merits. We learn first that plant life is a chemical process for catching the sun's rays and depositing them on the earth in the form of carbon. As with mortal souls, however, the abode of carbon on the earth is but transitory; "some day fire is set to it," whereupon it disappears from the earth as gas and only ashes remain.

Early plants floated in moisture in a sexless state, but they finally succeed in getting roots into the soil, climbed out of the marshes and developed sex, and so rose to the stage of seed production. Until they got their toes into *terra firma* evolution was slow, but that advantage once gained they "developed faster—from grasses to shrubs, from shrubs to bushes and from bushes to trees!" Animals also play an important rôle in the cosmos, for we are told:

> If it were not for the existence of animal life the leaves, bark and general residue of vegetation would, in a period of twenty-five years or thereabouts, cover the ground to such a height that no new vegetation could spring up and plant life would annihilate itself, there being no decay.

About three and one half pages are left for the "laws," which are illustrated by diagrams relating to relative size of flower or fruit or other character of the plants to be crossed. There are three possibilities: (1) The male (pollen) parent may be smaller than the female (ovule) parent, (2) they may be of the same size, or (3) the male parent may be the larger of the two. The first is the "declining way" of breeding, for the offspring from such crosses will be smaller even than the male parent. The second is the "enlarging way," for when the parents are of the same size the offspring will be twice as large as their parents. Not all of them will reach this maximum size, we learn to our disappointment, but on the average only 12 in 100. This may be brought up to 40 per cent., nevertheless, in later generations. Finally, the third way is less important, for under these conditions the offspring are said to exceed the male parent only slightly in size.

Fortunately the benefits of these laws are not limited to plants but may be applied in animal breeding as well, as "exemplified by chickens." Here the process is admittedly complicated by the fact of "the sexes being in different individuals," necessitating a back-cross of the progeny with their male parent, but the result is well worth the extra trouble, for "of the offspring from this second fertilization about one third are double the size of the original parents." This may be a desirable economic result so far, but one shudders to think what may happen if the method should be taken up by unthinking persons and pushed to the limits of geometric progression. The author truly says that "few people at the present time realize the immensity of this discovery to mankind." He himself modestly admits that it is "equal to the discovery of electricity, if not greater." And any one may take advantage of it by purchasing the booklet for the sum of five dollars—as indicated by another rubber stamp.

A book of this character would scarcely be deserving of so much attention if it were not for the fact that it is likely to be taken seriously by a great many people. There is just enough of fact in some of the statements to make the conclusions seem plausible to one not familiar with genetic interpretations. For example, it is stated that in attempting to derive new colors, a white flower should be used as the pollen parent. Every geneticist knows that white flowers may carry a great variety of genes for color which can find expression only when a cross is made which brings in an activator for them. Similarly, some of the facts stated in relation to size inheritance may be true in the instances

cited; the mistake is the one practical breeders have so commonly made for generations past of generalizing from a few instances. One often wishes it were as easy to inculcate into students the principles of genetics as it is to gain a wide acceptance of theories that have no scientific basis and calmly disregard any demands for proof.

L. J. C.

## SPECIAL ARTICLES

### ON THE RELATIONSHIP BETWEEN FREEZING POINT LOWERING, Δ, AND SPECIFIC ELECTRICAL CONDUCTIVITY, K, OF PLANT TISSUE FLUIDS

The problem of the contribution of non-electrolytes, of undissociated molecules of electrolytes, and of dissociated ions of electrolytes to the depression of the freezing point, Δ, in terms of which osmotic concentration is usually measured, is one of considerable biological importance. We desire to know, for example, whether an observed difference in the osmotic concentration of the tissue fluids of a species growing in two different habitats is due primarily to differences in the quantities of electrolytes absorbed from the medium or to differences in the quantities of organic substances elaborated. The same question naturally arises when one is comparing the osmotic concentration of the tissue fluids of different species in the same habitat.

In the mixed solutions with which the biologist has to deal the problem presents serious difficulties. In certain cases some progress may be made by determining the correlation between the freezing point depression, Δ, and the specific electrical conductivity, $K$.

As a specific illustration we may take the relationship between osmotic concentration and electrical conductivity in a series of plant species growing in the non-halophytic habitats of the north shore of Long Island.[1]

In a series of 19 species of trees, 36 species of shrubs, and 162 species of herbs both Δ and $K$ are highly variable. The coefficients of variation, *i.e.*, 100 $\sigma/m$, where $\sigma$ is the standard deviation and $m$ the means are:

| | Δ | $K$ |
|---|---|---|
| Trees | 21.46 | 28.49 |
| Shrubs | 18.46 | 28.03 |
| Trees and shrubs | 20.20 | 28.27 |
| Herbs | 23.46 | 25.33 |

Our problem is to determine whether higher values of $K$ are associated with higher values of Δ, or whether within each of these growth forms[2] these two constants of the solution are essentially independent.

Determining the correlation coefficients by the usual product moment method we have the following measures of relationship between the magnitudes of $K$ and Δ in the various series.

For trees, $N = 19$, $r = +0.127 \pm .152$
For shrubs, $N = 36$, $r = -0.079 \pm .112$
For trees and shrubs, $N = 55$, $r = +0.022 \pm .091$
For herbs, $N = 162$, $r = +0.150 \pm .052$

For ligneous plants the correlations between Δ and $K$ are low and statistically insignificant in comparison with their probable errors. The coefficient for shrubs is actually negative in sign. That for trees and shrubs together is sensibly zero. The coefficient for herbaceous plants is also low but may indicate a slight relationship between the two constants, higher values of Δ being associated with higher values of $K$ and *vice versa*.

These results show that, in the vegetation of the glacial moraines of Long Island at least, there is practically no relationship between the concentration of ionized electro-

[1] Protocols of data and full details are given in a paper in press in the *Journal of Physical Chemistry*.

[2] It is necessary to separate the growth forms, since, as shown in detail elsewhere (Harris, Gortner and Lawrence, *loc. cit.*), the growth forms are highly differentiated with respect to both Δ and $K$. The actual means are:

| | Δ | $K \times 10^6$ |
|---|---|---|
| Trees | 1.292 | 11,213 |
| Shrubs | 1.177 | 10,770 |
| Trees and shrubs | 1.217 | 10,923 |
| Herbs | 0.846 | 14,308 |

lytes and of total solutes (molecules and ions) in the leaf tissue fluids.[3]

J. ARTHUR HARRIS,
ROSS AIKEN GORTNER,
JOHN V. LAWRENCE

## THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

### MINUTES OF THE EXECUTIVE COMMITTEE OF THE COUNCIL

THE meeting was called to order at the Hotel Belmont, New York City, on October 17, at 11 A.M., with Dr. Simon Flexner in the chair. The following members were present: Cattell, Fairchild, Flexner, Humphreys, Livingston, Nichols, Osborn.

1. *Minutes of last meeting* (published in SCIENCE, May 7, 1920) were approved.

2. *Audited report of retiring permanent Secretary* (Dr. L. O. Howard, for period from November 1, 1919, to April 1, 1920, was accepted and ordered to be filed and published in SCIENCE.

3. *Summarized report of new permanent secretary* (Dr. Burton E. Livingston) for period from April 1 to September 30, 1920, was accepted and it was ordered that such parts of it be published in SCIENCE as seem desirable to the permanent secretary. (The financial statement will be presented to the council before publication; other features will shortly appear in SCIENCE.)

4. *Election of section officers.*—Dr. A. E. Jenks was elected to be vice-president and chairman of Section H (Anthropology). Dr. E. A. Hooton was elected secretary of Section H.

5. *A special committee on the organization of Section H (Anthropology)*, which is a new section, formed by the division of the old Section of Anthropology and Psychology, was established, this committee to be appointed by the president and permanent secretary in collaboration and to cooperate with the section officers just elected. (This committee will shortly be announced in SCIENCE.)

6. *Present permanent secretary* was nominated to the council, to continue to serve during the ensuing 4-year term as heretofore; that is for one third of his time.

7. *Other nominations for Association officers* (president, general secretary, treasurer, five council members, two executive committee members). It was voted that these nominations be made at the first meeting of the council at Chicago and that elections occur at a later meeting of the council.

8. *Nominations for Committee on Grants* (3 members), to be appointed by the president with advice of the council. The executive committee recommends to the council that it is desirable to nominate members who are not now members of the Grants Committee, but the various branches of science should continue to be severally represented as heretofore. This matter should receive attention at first Chicago meeting of Council and nominations should be made at second meeting.

9. *Science News Service,* supported by Mr. W. E. Scripps. Dr. J. McK. Cattell and Dr. Geo. T. Moore were elected to represent the association in an advisory committee of this service.

10. *Editorial Committee for Science.*—It was voted that this committee continue to be constituted as heretofore; namely, of (*a*) its original members, (*b*) the chairman of the association sections for each year, and (*c*) the members of the executive committee.

11. *Determination of the chairman of Executive Committee.*—It was voted that chairman of this committee is to be elected by the committee at its last session at each 4-year meeting of the association, the term of office of the chairman to be for no more than four years.

12. *Election of Fellows.*—Three hundred and seven members were elected to fellowship, their nominations having been received from the following sources: by Secretary of Section A, 6; by Secretary of Section B, 37; by Secretary of Section E, 35; by Secretary of Section G, 162; by Secretary of Section O, 5; by Secretary of Section Q, 56; by permanent secretary, 6. It was voted that nominations for fellowship received by the permanent secretary shall hereafter be referred to the secretary of the proper section, so that all nominations shall come to the executive committee from the section secretaries. (Nominations for fellowship should be sent to section secretaries rather than to permanent secretary. Section secretaries are urged to send their lists of nominations to the permanent secretary in time so that they may be acted on at each meeting of the executive committee.)

13. *Auditor* for permanent secretary's annual report. The resignation of Mr. Herbert A. Gill was accepted and filed, and the committee passed

[3] This result holds within the individual classes. In comparing ligneous and herbaceous growth forms we note that the growth form with the higher total concentration has the lower conductivity. This is shown by the fact that the ratio of $K \times 10^6$ to $\Delta$ is 10923/1.217 for trees and shrubs but 14308/0.846 for herbs.

a unanimous vote of thanks to Mr. Gill for his valuable and much appreciated services as auditor. The appointment of an auditor for this year was referred to the president and permanent secretary, with power.

14. *Organization of Committee on Grants.*—It was voted that Committee on Grants shall elect its chairman and secretary.

15. *Place of 1922–23 annual meeting.*—This was discussed, and Boston was tentatively recommended. (The 1921–22 annual meeting is to be held at Toronto.)

16. *Expenses of section secretaries attending annual meetings.*—It was voted to recommend to the council that Art. X., Sect. 2, of the by-laws be so amended as to authorize the permanent secretary to pay section secretaries who attend annual meetings a refund amounting to four cents per mile for the round trip in each case.

17. *Expenses of section secretaries attending the Chicago meeting.*—The permanent secretary was authorized to refund to each section secretary attending the Chicago meeting a sum amounting to four cents per mile for his round trip.

18. *Expenses of executive committee members* attending spring and fall committee meetings. It was voted to recommend to the council to take under consideration the amendment of Art. X., Sect. 3, of the by-laws so as to authorize the permanent secretary to pay executive committee members attending spring or fall meeting of this committee a refund amounting to four cents per mile for the round trip in each case.

10. *Sonora and Chihuahua.*—It was voted to recommend to the council that Art. VI., Sect. 1, of the by-laws be so amended as to remove the Mexican states of Sonora and Chihuahua from the province of the Pacific Division and to place them in that of the Southwestern Division.

20. *Benjamin collection of portraits and autographs of association presidents.*—It was voted to recommend to the council that it authorize the permanent secretary to purchase for the association the Benjamin collection of portraits and autographs of the presidents of the association (74 portraits, each with autograph letter), at a price of $300.

21. *Proposal to inaugurate a section on History of Science.*—This action has been recommended by a large number of members. The proposal was thoroughly discussed but the committee did not feel justified in recommending it, since the proposed section would not be coordinate with the sections already established. It was suggested that this very desirable aspect of scientific advancement (which is thoroughly approved by the committee) be organized in the new section L (Historical and Philological Sciences), to which it appears logically to pertain.

22. *Committee vote by mail.*—It was voted that Professor Pickering's method for voting by mail be generally used by the permanent secretary when such voting of this committee is requisite.

23. *The Gamma Alpha Graduate Scientific Fraternity* was made an affiliated society by vote of this committee. (It will have two representatives in the association council.)

24. *Affiliation of state academies.*—It was voted to extend the special offer on this subject through 1921. Academies becoming affiliated before October 1, 1921, are to receive from the permanent secretary a payment amounting to one dollar for each academy member who has paid his annual dues ($5) to the association for the year 1921.

25. *Stationery for use of section secretaries.*—Proposal that permanent secretary's office furnish uniform stationery to all section secretaries was referred to permanent secretary, with power.

26. *Sectional committee personnel.*—It was voted that when an affiliated society embraces more than a single section of the association, its representatives in the association council shall not be members of any sectional committee.

27. *Railway rates for annual meetings.*—It was voted that the permanent secretary be instructed to investigate the basis on which reduced railway rates are sometimes granted to societies, with the aim of obtaining these rates for annual meetings of the association in the future. (Reduced rates for the Chicago meeting have been denied.)

The committee adjourned at 4.

Burton E. Livingston,
*Permanent Secretary*

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